EFFECT OF TRAINING ON KINEMATIC ADAPTATION FOR PACE BOWLING IN CRICKET

A Synopsis

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INTRODUCTION

Modern cricket is an International sport and team sat all levels strive to develop fast bowlers who can generate high ball release speeds. The ability of bowlers to bowl with high ball release speeds contributes to the successful performance of cricket teams.(Portus, Sinclair, Burke & Moore,2000).Bowling, batting and fielding are three fundamental skills in cricket. Significant Bio mechanical research has been focused on bowling and batting (Bartlett, Stockill, Elliott & Burnett, 1996). Fast/medium bowling in cricket is an activity which produces high ball velocities at release through generating a variety of forces and torques in the body to accomplish these ball velocities at delivery. Bowlers undergo a huge amount of twisting, bending, rotation, flexion and extension over a short period with the added necessity of accommodating the ground reaction forces generated (McGrath et al., 1996).

In order to improve the performance and minimize the risk of injury the technique of a cricket bowler must be reformed through effective coaching intervention. In few studies quantitative evidence has been produced to objectively assess the effectiveness of such interventions (Grimshaw and Burden, 2000, Dallam et al., 2005, Winchester et al., 2005). The lack much more such studies may be due to factors such as; inability to obtain a sufficiently large, homogenous group of athletes, a lack of access to motion analysis equipment and the testing environment for the athlete to perform with sufficient ecological validity.

In cricket till 2009 there have been only four such studies what the researcher reviewed that have investigated the efficacy of fast bowling technique modification, both investigating groups of young fast bowlers (Ranson, C.A.et al, 2009, Peter Worthington 2009,Elliott and Khangure, 2002, Wallis et al., 2002) where the result of these study has clearly shown that specific aspects of fast bowling technique can change in elite players over a two year period and this may be attributed to coaching intervention.

It has yet to be determined whether junior, junior level pace bowlers with specific habituated bowling actions through years of playing and training, are amenable to alterations in specific aspects of bowling technique. When attempting to change a bowler's technique, coaches used tailored interventions for the bowlers they coach as there is no logical reason to address elements of technique that don't require change.

Furthermore, coaches need to make changes to key elements of technique without changing their natural talent and aspects of technique which may have made them successful in the first place. Knowledge of the changeability of this highly complex motor skill in junior level bowlers may give some insight into the ability of coaching to alter technique characteristics.

A better understanding of the bowling technique development occurrence will provide educators, coaches and players with useful information for developing coaching guidelines and designing in-season intervention programs. Consequently, the intent of the present study is to evaluate the effect of six months coaching intervention on pace bowling technique, and to investigate the time course for kinematic adaptations to coaching intervention programme in cases of junior pace bowlers and progressions. In this study attempts will be made through investigation (i) whether, and if so, how much and within which time course a comprehensive coaching intervention programme can develop the bowling technique of junior level male pace bowlers and (ii) how the intervention programme reformed their earlier acquired bowling skill.

Statement of the Problem

The purpose of the study is to find out the effect of coaching intervention on pace bowling technique over a six month period of junior level pace bowlers.

Delimitations

The study will be delimited to the following aspects.

1) The study will be delimited to 20 junior cricket players.

2) The subjects of the study will be selected from West Bengal.

3) The subject's age will be ranged between 14 to 18 years.

4) The coaching intervention for the study will be of six months.

5) Selected kinematic variables will be as follows:

a. Approach Run
b. Knee angle at Back -foot strike
c. Shoulder alignment at back-foot impact
d. Minimum shoulder alignment
e. Knee angle at front-foot strike
f. Shoulder separation angle
g. Hip Separation Angle
h. Shoulder counter rotation
i. Knee angle at ball release
j. Ball Release Height
k. Ball Release Speed

Limitations

1. Non-availability of sophisticated instruments would be considered as another limitation of this study.
2. Daily routine life and voluntary participation in other physical activities by the subjects, which will be not under control of researcher.
3. There will be no control over their habit, diet and motivation.
4. There will be no control over environmental factors.
5. Their sociological aspects and their day-to-day activities will not be considered.

Hypotheses

It is hypothesized that

1) A twenty four week comprehensive coaching intervention programme will develop the bowling technique of junior level male pace bowlers.
2) The coaching intervention training group will be superior to control group on bowling skill during the investigational period
3) The coaching intervention effects of pretest to mid tests will be superior mid test to posttest during the testing period
4) The coaching intervention programme will gradually reformed the acquired bowling drawbacks.

Definition of the Important Terms

Kinematics

Kinematics is the branch of classical mechanics that describes the motion of points, bodies (objects) and systems of bodies (groups of objects) without consideration of the forces that cause it. Kinematics is description of motion and includes consideration of time, displacement, velocity, acceleration and space factors of a system's motion. (R.T.Floyd.et al, 2012).

Coaching

Coaching is training or development in which a person called a coach supports a learner in achieving a specific personal or professional goal. The learner is sometimes called a coaches. (Encylopedia-2015).

Pace Bowling

Fast bowling, sometimes known as pace bowling, is one of the two main approaches to bowling in the sport of cricket. The other is spin bowling. Practitioners are usually known as fast bowlers, fast-men, pace bowlers, quicks, or pacemen, although sometimes the label refers to the specific fast bowling technique the bowler prefers, such as swing bowler or seam bowler. (Encylopedia-2015).

Significance of the study

1. The results of the study will enlighten the technique of the junior pace bowlers and their fitness

2. It would enhance the awareness of the Coaching Intervention and bowling directives among the players and coaches.

3. The research will be helpful to examine the effects on Kinematic variables and improvement on skill performance due to coaching intervention for junior cricketers.

4. The result of the study may provide latent justifications for severe modifications in technique.

5. The revealed facts would contribute to the physical educationists, sports scientists and cricket scientists to enhance their knowledge about the junior level pace bowlers especially who belongs to West Bengal.

REVIEW OF RELATED LITERATURE

Ranson, C.A. et al, 2009 titled the effect of coaching intervention on elite fast bowling technique over a two year period where 14 elite young fast bowlers were measured using an 18 camera Vicon Motion Analysis system before and after two-year coaching interventions that addressed specific element(s) of fast bowling technique. This study has clearly shown that specific aspects of fast bowling technique can change in elite players over a two year period and this may be attributed to coaching intervention. However, although factors related to shoulder alignment at the beginning of the fast bowling delivery stride were changed, desired improvements in trunk posture and knee mechanics later in bowling action i.e. during FFC, were not able to be achieved in this group.

Peter Worthington, 2009 in a study titled the effect of individualized coaching interventions on elite young fast bowler's technique where 14 elite young fast bowlers were measured using an 18 camera Vicon Motion Analysis System. Subjects were tested before and after a two year coaching intervention period, during which subject-specific coaching interventions were provided. Mann-Whitney tests were used to identify significant differences in the change in the selected kinematics between those bowlers who were coached or un-coached on each specific aspect. Coached athletes demonstrated a significant change in shoulder alignment at back foot contact (more side-on, $P = 0.002$) and shoulder counter-rotation (decreased, $P = 0.001$) relative to un-coached athletes. There was no difference in the amount of change in flexion angles of the front or back knee or lower trunk side-flexion between those who received coaching intervention and those that did not. This study shows that specific aspects of fast bowling technique in elite players can change over a two year period and may be attributed to coaching intervention.

Ranson, C.A. et al,2008 in Journal of Sports Science titled The relationship between bowling action classification and three-dimensional lower trunk motion in fast bowlers in cricket where 50 fast bowlers were involved in Three-dimensional kinematic and Lower back injuries, specifically lumbar stress fractures, account for the most lost playing time in professional cricket. And he concluded a very high percentage of fast bowlers in this, and other studies, have been classified as having a mixed bowling action whilst no bowlers in this study were classified as front-on. Further, fast bowling action characteristics currently used to identify potentially dangerous action types do not appear to be directly related to the likely pathomechanics of contra lateral side lumbar stress injuries.

Hurrion & Harmer,2002, titled The Fast-Medium Bowler ,Sports Biomechanics and Technical Analysis Model where sixty fast-medium bowlers playing England age groups U13, U14, U15, U17 and U19 were filmed and analyzed during competitive play. Each bowler was filmed from three angles, side-on, front-on and back view. Technical and biomechanical analysis were made for each bowler using the following phases, Pre Delivery Stride (gather),Mid bound, Back Foot Contact, Mid position // Front foot contact, Release and Follow Through. The most common biomechanical and technical faults were identified. This data was used to develop a technical model of sports biomechanics and analysis for all fast-medium bowlers. The authors suggest that if the seven most common technical faults can be eradicated then the young fast-medium bowler would reduce the risk of injury and fully maximize his / her potential.

METHODOLOGY

Subjects

For the purpose of the study 20 male junior pace bowlers of West Bengal will be the subject of this study. Their age ranges 14-19 years. The subjects will be selected from West Bengal Cricket clubs at random who at least played for state level.

Design of Study

The experimental design used in this study will be repeated measures design. The subjects will be divided at random into one experimental group and a control group. The experimental Group (GE) underwent the progressive bowling intervention programme while control group (GC) will carry out their normal cricket training sessions. The coaching intervention will be of six months (24 weeks), 4 days in a week with duration of 60 minutes per day.

Training Programme

The following coaching intervention programme will be of 24 weeks long. It consists of warm ups, Technical coaching session with drills, cooling down sessions per week. The intervention programme will start from relatively easy and gets progressively harder. Alternate days will be used between the 4 phases of bowling so that the subjects will not perform the same technique and drills on consecutive days all the subjects will be given a detail of coaching schedule to understand the intervention programme before they start coaching programme.

Components of Coaching Intervention Session:

Warm-up: 5-10 minutes- low to moderate intensity exercises

Dynamic Stretching: At least 10 min. after warming-up

Bowing Technique Training: 60 mins. –Approach run (Run-up), Pre-delivery Stride, Delivery Stride and Follow-through.

Cool-down: 5-10 minutes- low to moderate intensity slow jog or a recreational game

Static Stretching: 10 minutes

Pre-Testing

Prior to the beginning of the experimental protocol subjects standing heights and weights will be measured by using stadiometer, weighing machine and history of injury information will be taken from the bowlers.

Experimental Protocol

Data will be collected through videography technique on the subjects of all the Experimental and the Control groups before, during [after 4^{th} week (Mid test: 1), 12^{th}week (Mid test: 2), 18^{th}week (Mid test: 3), 24^{th} week (Mid test: 4)] of the investigational period to observe the progressive development, if any. However, experimental treatment was given to the experimental group only.

Data Collection

Filming Procedures

Six Digital HD video cameras, mounted on tripods, filmed each bowler during the bowling spells. The cameras will be positioned in such a place from where the locus of movement of the major joint markings on the body will be central to the video graphic plane of all cameras, and such that at least two cameras may track these land marks throughout the delivery stride. The experimental configuration is shown in figure 1.

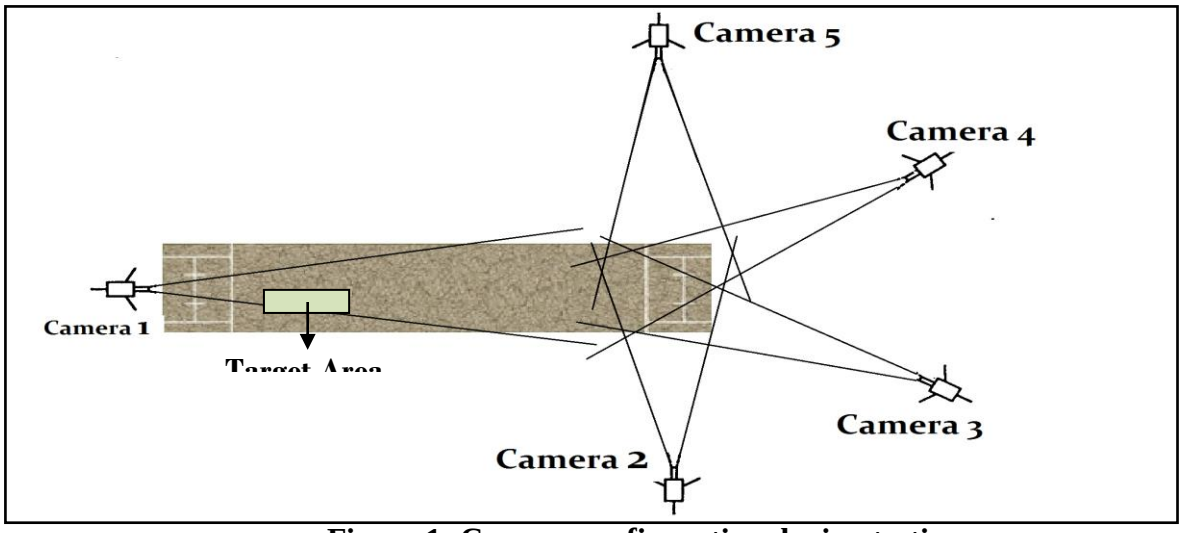

Figure 1: Camera configuration during testing

The balls of each bowler's during their spell which will be delivered at the target area (Figure 1), will be recorded on film for analyses [Burnett, A., Elliott, B. and Marshall, R. (1995)]

The stick figures will be developed by using segmentation method suggested by HAY. J.G, (1978) and the ball release speed of each delivery bowled will be analyzed by using the Radar gun /Kinovea- 8.24 software.

Kinematic Variables

- Approach Run
- Knee angle at Back -foot strike
- Shoulder alignment at back-foot impact
- Minimum shoulder alignment
- Knee angle at front-foot strike
- Shoulder separation angle
- Hip Separation Angle
- Shoulder counter rotation
- Knee angle at ball release
- Ball Release Height

- Ball Release Speed

Reliability of data

The reliability of the data will be established through test and retest method. Ten junior pace bowlers will be randomly selected from the local club and filmed each bowler during the bowling spells. The video will be analysed twice for test and retest to establish the reliability of the obtained kinematics values.

Analytical Procedure to be used

In order to test the homogeneity of the subjects' descriptive statistics will be applied, to test the effect of intervention programme, the collected data from the two groups before, during and after investigation on Pace bowling performance variables were statistically analyzed by using one-way analysis of variance with repeated measures (SPSS, version 17.0 Inc, Chicago IL, USA).

Whenever, one way ANOVA with repeated measures 'F' ratio interaction values are found to be significant, the post hoc test was used to determine which of the paired mean had significant differences. In all the cases the level of confidence is fixed at 0.05 to test the significance.

KEYWORDS

TRAINING, KINEMATIC ADAPTATION, PACE BOWLINGACTION, CRICKET

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